

**AMENDMENTS TO THE SPECIFICATION:**

Please replace the first paragraph of the specification under the section entitled "Cross Reference to Related Application" with the following paragraph:

-- This application is a continuation of U.S. Application Serial No. 09/779,021 filed on February 7, 2001 which is a continuation of U.S. Application Serial No. 09/235,593 filed on January 22, 1999 which claims priority to U.S. Provisional Application Serial No. 60/072,406 filed on January 23, 1998, the contents of which are hereby incorporated by reference in their entirety.--

On page 4, line 22, change "front edge 54" to -- front edge 45--;

line 24, change "outer edge 56" to -- outer edge 46--.

On page 5, line 1, change "shaft 35" to --shaft 34--.

**AMENDMENTS TO THE DRAWINGS:**

Please substitute the attached formal drawings for the drawings of record.



**Patent Application**  
Attorney Docket: 203-2526 (1999)

## **SURGICAL INSTRUMENT HOLDER**

### **CROSS REFERENCE TO RELATED APPLICATION**

This application claims priority to U.S. Provisional Application Serial No. 60/072,406 filed January 23, 1998, the contents of which are hereby incorporated by reference in their entirety.

### **BACKGROUND**

#### **1. Technical Field**

The subject disclosure relates to minimally invasive surgical procedures and apparatus, and more particularly to apparatus for holding surgical instrumentation during surgery associated with the thoracic cavity.

#### **2. Background of Related Art**

It is well established that the performance of various types of surgical procedures using less invasive techniques and instrumentation has provided numerous physical benefits to the patient while reducing the overall cost of such procedures. One area, for example, which has experienced a great increase in the performance of less invasive procedures is in the area of heart surgery. In particular, coronary artery bypass graft (CABG) procedures have been performed using less invasive techniques with much success.

Access to the patient's thoracic cavity for such procedures in the past was typically achieved by a large longitudinal incision in the chest. This procedure, referred to as a median sternotomy, requires a saw or other cutting instrument to cut the sternum and allow two opposing halves of the rib cages to be spread apart. U.S. Patent No. 5,025,779 to Bugge discloses a retractor which is designed to grip opposite sternum halves and spread the thoracic cavity apart. The large opening which is created by this technique enables the surgeon to directly visualize the surgical site and perform procedures on the affected organs. However, such procedures that

involve large incisions and substantial displacement of the rib cage are often traumatic to the patient with significant attendant risks. The recovery period may be extended and is often painful. Furthermore, patients for whom coronary surgery is indicated may need to forego such surgery due to the risks involved with gaining access to the heart.

U.S. Patent No. 5,503,617 to Jako discloses a retractor configured to be held by the surgeon for use in vascular or cardiac surgery to retract and hold ribs apart to allow access to the heart or a lung through an operating window. The retractor includes a rigid frame and a translation frame slidably connected to the rigid frame. Lower and upper blades are rotatably mounted to the rigid frame and the translation frame respectively. Such a "window" approach requires instrumentation that can be inserted into and manipulated within the limited space available in and around the surgical site.

Therefore, a continuing need exists for more versatile and varied surgical instrumentation which facilitates performing surgical procedures in limited access cavities of a patient during less invasive surgical procedures. A need also exists for instrument holding apparatus to retain surgical instruments in place during surgical procedures and free the surgeons hands.

## **SUMMARY**

The present disclosure addresses the above-noted needs while providing various embodiments of an apparatus for holding surgical instruments that have many unique features and advantages over the prior instrumentation. The presently disclosed apparatus for holding surgical instruments provides greater versatility during surgical procedures which are less invasive than traditional procedures.

For example, in one embodiment, the present disclosure provides an apparatus for holding a surgical instrument relative to a base, which includes a mounting portion configured and dimensioned to engage a portion of a base, a jaw assembly including first and second jaw members which define a retaining area therebetween configured and dimensioned to retain the shaft of a surgical instrument therein and thereby fix the length of the instrument shaft relative to the base and an operative site, and an instrument position adjustment mechanism which includes an adjustment member rotatably disposed in relative to the mounting portion to facilitate selective position adjustment of the jaw assembly with respect to the mounting portion.

The instrument position adjustment mechanism may include a lock member such that when positioned in a locked position, the adjustment member is prevented from moving relative to the mounting portion and when the lock member is positioned in an unlocked position, the adjustment member is permitted to move relative to the mounting portion. The jaw assembly preferably includes a jaw approximation control member which controls movement of one of the first and second jaw members relative to the other of the first and second jaw members.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

Various preferred embodiments are described herein with reference to the drawings, wherein:

FIG. 1 is a perspective view of a surgical retraction system incorporating a variety of retractors, a heart manipulator and a heart stabilizer, all positioned on a base;

FIG. 2 is a perspective view of the instrument holder of the present disclosure showing an instrument shaft retained in the horizontal position and the jaws in the open position;

FIG. 3 is a side view of the instrument holder in the position of FIG. 2;

FIG. 4 is a perspective view of a first section of a base mounting assembly of the present disclosure;

FIG. 5 is a perspective view of a second section of the base mounting assembly;

FIG. 6 illustrates the ball for enabling maneuverability of the jaw assembly;

FIG. 7 illustrates a side view of the shaft which is connected at one end to the ball and at the opposite end to the jaw assembly;

FIG. 8 is a side view of the locking screw which retains the ball in a fixed position;

FIG. 9 illustrates the handle which attaches to the locking screw for rotating the screw;

FIG. 10 is a side view showing the handle attached to the locking screw to form a ball locking assembly;

FIG. 11 is a perspective view illustrating the instrument holder with the jaws in the closed position and maneuvered to hold the instrument shaft at an angle;

FIG. 12 is a side view illustrating the instrument holder maneuvered to position the instrument shaft perpendicular to the base of the retraction system;

FIGS. 13A and 13B are perspective and side views, respectively, of the stationary jaw for

holding the instrument shaft;

FIG. 14 is a perspective view of the movable jaw;

FIG. 15 is a perspective view of an alternative embodiment of an instrument holder constructed in accordance with the present disclosure; and

FIG. 16 is a side view of the instrument holder embodiment of FIG. 15.

### **DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS**

The instrument mounting holder of the present disclosure is designed to mount various accessory instruments to the ring base disclosed in U.S. Patent application Serial No. 08/718,283, filed September 20, 1996, the entire contents of which are incorporated herein by reference. FIG. 1 is a drawing from the '283 patent application and shows a base 50, retractors 60, 70 and 80, a heart stabilizer 90 and a heart manipulator 100. A detailed description of these instruments, how they are mounted to the base 50, and their surgical function is disclosed in the '283 application.

The present disclosure is directed to an instrument holding apparatus, which is removably positionable on base 50, and can mount a variety of instruments such as an illumination instrument, a grasper, a retractor, a heart stabilizer or any other instrument that would be useful in performing the surgical procedure. Only the shaft of the accessory instrument is shown in the drawings and is represented generically by reference letter "S".

Referring to FIGs. 1-5, instrument holder 1 includes a mounting portion, such as a base mounting assembly 10 composed of a first section 12 and a second section 14, an instrument position adjustment mechanism 30, and a jaw assembly 51 for supporting the instrument shaft S. As best shown in FIG. 4, first section 12 includes a neck 19 having a socket 15 formed therein for receiving a ball 32, described below. A lip 18 is formed to hook around a front edge 54, FIG. 1, of base 50. An extension 16 extends through a groove 22 formed in second section 14, shown in FIG. 5. A lip 20 of second section 14 is configured to mount to an outer edge 56 of base 50. A biasing spring, not shown, is attached at one end to first section 12 and at the opposite end to second section 14 to help retain the sections 12 and 14 together while allowing first section 12 and second section 14 to be pulled slightly away from each other, against the force of the spring, to facilitate mounting to and release from base 50.

Referring to FIGs. 6-12, position adjustment mechanism 30 includes a ball 32, FIG. 6, a

jaw assembly 51.

Referring to FIGs. 15 and 16, an alternative embodiment of the presently disclosed apparatus for holding instruments is designated as instrument holder 100. Instrument holder 100 is similar to instrument holder 1. Therefore, the following description will only focus on those aspects of instrument holder 100 which differ from instrument holder 1. In contrast to base mounting assembly 10 of instrument holder 1, instrument holder 100 includes a mounting portion, such as a base mounting assembly 110 which is in the form of a clip having first and second lips 118, 120 which extend from a bottom surface of mounting assembly 110. Mounting assembly 110 is preferably fabricated from flexible material and includes a cantilevered extended portion 111 which deflects upon the application of a generally vertically directed force. Thus, in order to mount instrument holder 110 to base 50, lip 118 is fitted over the inner rim of base 50 and instrument holder 100 is moved into closer approximation with base 50 so that lip 120 cams outwardly and flexes extended portion 111 upwardly until lip 120 passes over the outer edge of base 50 and snaps back to its normal configuration as shown in FIG. 16. Once positioned on base 50, instrument holder 100 functions in the same way as instrument holder 1 described above to retain surgical instruments therein.

Another difference between instrument holder 100 and instrument holder 1 is the configuration of the locking knob. In particular, screw handle 38 of instrument holder 1 is in the form of a rotatable lever whereas screw handle 138 of instrument holder is in the form of a wing having extended portions 138a and 138b extending radially outwardly from the center along a plane.

It will be understood that various modifications may be made to the embodiments of the apparatus for holding surgical instruments shown and described herein. Therefore, the above description should not be construed as limiting, but merely as examples of preferred embodiments. Those skilled in the art will envision other modifications within the scope and spirit of the present disclosure.